

## Medical botany in northern Italy in the Renaissance<sup>1</sup>

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One of the characteristic features of sixteenth century medicine was its optimism. Physicians were convinced that great changes were taking place, that medicine was being renewed as they deliberately put the Middle Ages behind them and strove to recover an ideal – the medicine of classical antiquity. And few branches of medicine aroused as much enthusiasm amongst sixteenth century doctors as *materia medica*. For here was a perfect example of Renaissance enterprise changing the face of a medical discipline (Reeds 1976). Italian humanists in the fifteenth century had recovered and translated ancient Greek botanical texts which had been unknown in the West in the Middle Ages or relatively ignored (Schmitt 1971, Riddle 1980). These inspired, in the sixteenth century, the founding of the earliest university chairs of *materia medica* – notably at Padua and Bologna in the 1530s. Soon after came the establishment of the first university botanical gardens. Padua and Pisa, in keen competition for students, both set up gardens in the mid-1540s (Chioyenda 1930). Botanical field trips became increasingly common, both to collect material for the new gardens, and to examine plants in their natural settings. Botanists in Italy travelled the length and breadth of the peninsula and also ventured overseas. Melchiorre Guilandino, for instance, who was in charge of the Paduan garden, spent three years, from 1558 to 1561, studying plants in the Middle East. He travelled from Constantinople through Palestine and Arabia to Egypt, and would have gone on to the East Indies had he not fallen into the hands of corsairs off the coast of Africa (Mieli 1921). A year or two later, Prospero Borgarucci, who had also studied at Padua, travelled as far as the mountains of Wales, where he struggled to interview local herbalists in Welsh, a language which he likened to ancient Greek (Borgarucci 1567, p 183). The spoils of such trips – seeds, cuttings, whole plants – were sent home to private and public gardens. Alternatively they might be stored up in herbals of dried plants – a new idea promoted by Luca Ghini, one of the earliest and most influential of the new professional teachers of botany (Battiatto 1972). These ‘dried gardens’ as they were called (*horti sicci*) might, in turn, find a place in another sixteenth century novelty, the natural history museum, like the one at Bologna owned by Ulisse Aldrovandi, one of Ghini’s best-known pupils.

Botany was also a field in which printing made a tremendous impact, through the development of the naturalistic illustrated herbal, pioneered in Germany in the 1530s and 1540s by the works of Otto Brunfels and Leonhart Fuchs, and continued in Italy from the 1550s by Pietro Andrea Mattioli. Associated with all these developments was the emergence of a large, but closely-knit community of botanists and natural historians, international in scope and spanning the religious divisions which followed in the wake of the Reformation. These were men united by common aims, and linked by frequent correspondence. Where their papers survive – as in the case of Aldrovandi at Bologna (Frati 1907) – we find eloquent testimony to the continuous interchange of the latest news, to the constant exchange of seeds and bulbs, dried and living plants.

Botany, then, was perhaps the most lively and fast-moving discipline associated with sixteenth century medicine. And unlike anatomy, with which it can be compared in terms of the enthusiasm it aroused, it was a discipline with a universal appeal – one which drew in not only doctors (though they always predominated), but also pharmacists, like Francesco Calzolari of

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Verona, owner of a well-known natural history museum and the author of a book on the flora of Monte Baldo (Tergolina-Gislanzoni-Brasco 1934), and even men outside the profession, like the Venetian nobleman Pietro Antonio Michiel, whose botanical garden in Venice was one of the most famous of its day, and who also played a prominent part in developing the University garden at Padua (Toni 1908). For botany, which appears, at first sight at least, to have been the most gentle of pursuits, was also the most gentlemanly. One thinks of the peaceful evenings spent by another Venetian patrician, Ermolao Barbaro, the earliest of the Renaissance translators of Dioscorides, who ended each day in the 1480s with a quiet half-hour in the garden, contemplating the herbs and thinking about Dioscorides (Branca 1973, Reeds 1976). Or of Pietro Andrea Mattioli, who wrote of

'the immense spiritual pleasure which results from looking at plants. For every gentle spirit rejoices in Spring or Summer when, for recreation, he goes wandering through meadows and fields, mountains and woods, amongst the verdant herbs and sweet flowers . . . Words cannot relate the pleasure and delight when a plant, long sought for, is found' (Mattioli 1548, dedication).

Here, then, was a discipline with a powerful appeal, which combined aesthetic pleasure with the passion of the collector, and which was also imbued with an ideal – that of improving therapeutics.

But if at first sight, gentleness, gentility and the ability to span religious divisions are qualities which seem to characterize Renaissance botany, a second look reveals a different picture. For of all the branches of medicine, there was none which aroused so many quarrels and controversy or which generated so much ill-feeling. This is apparent in the way in which sixteenth century botanists referred to each other. Take, for instance, Luigi Anguillara, first custodian of the earliest botanical garden, at Padua, and author of what seems a perfectly respectable book on simples – Anguillara, described by more than one of his colleagues as '*quel asino*', that ass (Toni 1911, p 156), or, punning on his name, '*scortica anguille*', eel skinner, a man, it was said, who could not tell basil from lettuce. Or take Andrea Alpago, one of the very few sixteenth century physicians who knew and was concerned to translate Arabic texts, written off as 'ignorant and of very little judgment', as '*quel cipollone*', that big onion of a man, like Anguillara so ignorant of botany that it was impossible to revile him more than he deserved. Or Amato Lusitano, the Portuguese author of a commentary on Dioscorides, known to his Italian rivals as 'that lying half-Jew', 'that proud beast'. Or Cesare Odone, who shared the botanical teaching at Bologna with Aldrovandi, described as '*questa bestia*', '*quel porcaccio*', that great pig (Raimondi 1906, pp 131–132, 142, 144–150). And a glance at the index of a book like Mattioli's commentary on Dioscorides shows that it served not merely to find things in the text, but to point out the shortcomings of colleagues. Take, for instance, the index entries for three prominent authors, Antonio Musa Brasavola, Leonhart Fuchs, and Janus Cornarius:

'Brasavoli lapsus, et eiusdem opiniones non acceptae  
Fuchsii errores, eiusque sententiae reprobatae  
Cornarii errata, et eius opiniones damnatae' (Mattioli 1554).

The seemingly innocuous subject of botany turns out to be one in which reputations were regularly torn to shreds. What was it that made botany so controversial? Here we need to understand what exactly Italian botanists were trying to achieve with their gardens, field trips, herbals and their tireless correspondence. To understand this we must go back to the late fifteenth century, when the work of two classical authors, Theophrastus and Dioscorides, became fully available in the West for the first time in centuries. Of these two, Theophrastus' books on the nature and causes of plants gained immediate respect for their treatment of philosophical and scientific themes – such as what makes plants grow, or what differentiates one plant from another. But they were books which had little immediate importance for medicine. They were taken up strongly by a few men like Andrea Cesalpino, whose Aristotelian outlook gave him a great interest in plant classification. Botanists writing the history of their subject tend to concentrate on Cesalpino, the forerunner of Linnaeus, as typifying progressive

Renaissance botany (Morton 1981). But in reality Cesalpino's work, and the influence of Theophrastus in general, were only minor themes in sixteenth century botany. Infinitely greater was the impact of Dioscorides. His 'De materia medica' was more practical, giving simple descriptions of a large number of plants, together with their medicinal uses. It was quickly recognized that Dioscorides alone held the key to ancient materia medica, to the wonderful curative drugs, not to mention the amazing aphrodisiacs, which Renaissance doctors longed to rediscover.

But the problems which Dioscorides posed were immense. To those who read his book it seemed, as Mattioli wrote, that the garden of medicine had run wild since classical times, through neglect and ignorance. Many Dioscoridean plants of immense therapeutic value could no longer be identified. At the same time botanical nomenclature was in chaos, with the result that the wrong plants, in some cases even poisonous ones, were in use in pharmacy (Mattioli 1548, dedication). What had brought this about? Charles Singer (1927) was in due course to blame 'the wilting mind of the Dark Ages', that period when a 'decayed western intellect', no longer able to cope with Dioscorides and Galen, fell back on simple herbals – 'feeble works for feeble minds'. In the sixteenth century, more charitably, Rembertus Dodonaeus blamed Arabic mistranslations, and too great a stress on philosophy and medical theory in the late Middle Ages to the neglect of practice and experience. Mediaeval doctors, he wrote, had thought it beneath them to study materia medica by tramping about the fields looking for plants, and had left it to ignorant herbalists, to unlearned pharmacists and, worst of all, to women. Dodonaeus also traced some of the problems back to classical botany itself. In his 'Histoire des plantes' he noted that Dioscorides and Theophrastus sometimes used the same name to indicate different plants, and that even Dioscorides sometimes fell into error (Dodonaeus 1557, dedication). But whatever their diagnoses, Renaissance doctors were agreed on what had to be done. Dioscorides' plant descriptions had to be minutely studied, his plants rediscovered, and the contents of the pharmacy re-examined with Dioscorides in mind. This was the programme which inspired the field trips, especially to the Eastern Mediterranean where Dioscorides had lived and worked, promoted the chairs of materia medica – which were essentially lectureships on Dioscorides – and underlay the foundation of the botanical gardens. The Paduan garden, for instance, was founded in 1545 because the Venetian government was aware of its unique responsibilities – ruling as it did over the herb gardens of antiquity, Crete and Cyprus, and enjoying close commercial relations with the whole Eastern Mediterranean. And the founding decree re-echoed the practical aim of the whole botanical programme – errors in pharmacy would be done away with, lives saved through the revival of classical materia medica (Venice, Archivio di Stato 1545).

In all this there was one overwhelming difficulty. Dioscorides' descriptions of plants were as maddeningly brief and sketchy as the area in which they grew was broad. There was scope for endless controversy as scholars put forward rival identifications of the ancient simples. Furthermore, there was no sustained tradition of botanical illustration to supply the missing clues. The various forms and epitomes of Dioscorides available in the West in the Middle Ages were unillustrated. In the East there were illustrated copies – above all the wonderful sixth century Juliana Anicia codex which was bought in Constantinople in the 1570s for the Imperial library in Vienna (Dioscorides 1965–70). But impressive as it was, it was still remote by several centuries from the mind of Dioscorides, and what attention was paid to it by sixteenth century botanists – for instance by Guilandino, who probably saw it in Constantinople in the 1550s – was for its value in solving textual problems, not for its illustrations (Hessus 1562, pp 38–39). And a comparison of the illustrations of the plant *φλομμος* in the Juliana Anicia codex with an even earlier representation of the same plant in the Johnson papyrus in the Wellcome Institute, dating from about AD 400, shows that already in late antiquity two illustrations of the same plant could look entirely different (Singer 1927, Dioscorides 1965–70). Mediaeval illustrations also gave very little help, tending to be stylized and frequently debased copies of each other, and serving a function more decorative than informative. And though there was a remarkable rebirth of naturalism in the area around Venice in the early fifteenth century – evident in the Carrara herbal (British Library Eg. MS 2020), the herbal of Benedetto Rinio

(Biblioteca Marciana Lat. VI, 59) or the Belluno manuscript (British Library Add. MS 41623) – it neither could, nor was intended, to throw new light on Dioscorides (Blunt 1950, Blunt & Raphael 1980).

Yet, in view of the difficulties which it faced, it is remarkable how far the Dioscorides project got in the sixteenth century. Its progress was charted in the successive editions of Mattioli's commentary on Dioscorides: long lists of missing drugs in the 1540s – balsam, cinnamon, petroselinum, myrrh, amomum, calamus odoratus and so on – followed by continuous reporting of rediscoveries as ambassadors, travellers, doctors on Venetian ships, or in consulates and embassies in Cairo, Constantinople and elsewhere, were drawn into the search for classical plants. Take, for instance, that most famous of antidotes and general cure-alls, theriac. Pharmacists throughout Italy in the sixteenth century raced each other in the search for the 81 animal, plant and mineral ingredients named in the classical texts. At first in the 1540s, writers on *materia medica*, like Mattioli, were doubtful of the value of theriac, since so many ingredients were missing, and so many substitutes had to be used in their place (Mattioli 1548, book 6, p 31). But all this changed as the botanical movement went from strength to strength. Prospero Borgarucci noted in 1567 (p 460) that it had once been necessary to use 20 or more substitute ingredients in theriac, but now only 5 or 6 were needed. The Neapolitan pharmacist Ferrante Imperato used 10 substitutes in his first theriac in 1557, 8 in his second theriac in 1561, and only 6 in his third theriac a decade or so later (Maranta 1572, pp 33–35). In Verona Francesco Calzolari had recourse to 6 substitutes in 1561, and to only 3 in 1566 (Calzolari 1566). The scepticism which Mattioli had expressed in the 1540s gave way in the 1560s to a paean of praise for the new theriac, which was now hailed as equal to that made by Galen for the Emperors (Mattioli 1568, p 955).

Mattioli's commentaries on Dioscorides provided the focus which the botanical movement needed. Though Mattioli was careful to take the credit, this was more than the work of one man. Mattioli's talent was for getting others to do the field work, while he wrote up the results. He himself did little active field work except as a young man in the valleys around Trent. From the time he was in his 40s he stayed at home, sighing to his readers over the domestic cares which alone prevented him from following the example of Galen, and sailing to Cyprus, to Lemnos to find the true *terra Lemnia*, to Palestine to find the true balsam (Mattioli 1548, dedication). By the time he reached the ripe old age of 54, advanced years became his excuse for avoiding field trips or travelling overseas. 'But', he wrote to Aldrovandi in 1554, 'as long as I live . . . I shall look to you and your peers to send me the fruit of your labours, and will record that I have received them from your hands, so that if you send me anything to add to my new Latin Dioscorides which will soon be reprinted, I will give you the credit, as I do with all who send me things' (Raimondi 1906, pp 146–147). And indeed, sixteenth century botanists fell over themselves to send Mattioli their latest discoveries, eagerly snatching up each new edition of the 'Commentaries' as it came from the press to see how many times, and in what terms, their names were recorded. Mattioli's book was, after all, one of the very greatest publishing successes of the century: 32 000 copies were said to have been printed in Venice of just the early editions, well before the work reached its most elaborate form in the richly illustrated Latin edition of 1565 (Mattioli 1561, p 261). Few botanists could bear not to be included, or risk falling foul of Mattioli, wielder as he was of one of the most vicious pens in Europe. Hence it was that the only published work of Luca Ghini appeared scattered through the pages of Mattioli's commentaries. Mattioli simply sent Ghini a long list of Dioscoridean plants which he had not yet seen or identified. Ghini, hailed by all his students as the most generous and gentle of men, sent in reply dried specimens of no less than 69 plants, accompanied by written opinions on their identification (Toni 1907). So too, when Mattioli first heard of Aldrovandi's large collection of plants, he wrote that his heart and soul would be in a state of suspense until he had seen them all. He longed to go to Bologna. All the same, he urged Aldrovandi to send the collection to him, 200 plants at a time, tied carefully within wooden crates. As a result, the 'Commentaries' were enriched, but there was little satisfaction for Aldrovandi. He hoped for a full written opinion on his collection, but Mattioli fobbed him off, after several years' delay, with talk of a letter lost in the post, or that even better sixteenth century excuse, a letter lost in

a shipwreck on the river Po (Raimondi 1906, pp 132–149). So it was that Mattioli, almost from his armchair, became the author of a book which summed up the aspirations and enterprise of a generation.

The 'Commentaries' first appeared in 1544. Mattioli was in his 40s, the obscure town doctor of a backwater of the Habsburg Empire, Gorizia, just to the north of Venetian Friuli. The early editions were in Italian. A Siennese, proud of his native Toscano, Mattioli was also concerned to write in a language which the ordinary man could understand – not least the ordinary pharmacist. At first it was a book without illustrations. Mattioli, who was to be the author of the most famous of the illustrated herbals, even included in the edition of 1550 a discourse which argued that illustrations of plants were of very little use, unable as they were to capture the ever-changing appearance of a plant from season to season (Mattioli 1550, prefatory letter and p 7). But after a decade which had seen the success of Vesalius' 'Fabrica' and Fuchs' 'De historia stirpium', Mattioli could not ignore for long the public appeal of the picture book. No sooner had he published his denunciation of the illustrated herbal, than he began to hire artists and engravers to prepare his own illustrations. They appeared for the first time in the first Latin edition of the commentaries in 1554. 'Now', wrote Mattioli, 'those who cannot go out in nature can have a garden at home' – a convenience, one suspects, that he himself appreciated (Mattioli 1559, dedication). He had now produced a book with universal appeal, which reached not only the learned physician but every literate man. Typically, the notebook of the Venetian physician and anatomist Nicolò Massa contains a note that he had lent his Mattioli to his barber (Venice, Istituzioni di Ricovero e di Educazione). The 1554 edition was dedicated to the King of the Romans, soon to become the Emperor Ferdinand, and Mattioli shrewdly employed an illuminator who spent three months preparing for him a magnificent copy for presentation, illuminated with gold and silver. 'I am hoping', wrote Mattioli, 'for some notable reward' (Raimondi 1906, p 137). Within a year it came – appointment as one of the doctors at the Imperial court. From this time he lived mainly at Prague, and later at Innsbruck, where he was able to rely on Ferdinand's patronage to finance further artistic work on his herbal. By 1558 he was employing two artists at his house in Prague, and five engravers in Vienna (Raimondi 1906, p 159). In 1565 the commentaries reached their fullest development in a folio edition running to nearly 1500 pages, crammed with full-page illustrations. Mattioli was now at the height of his powers. 'That God of the herbaria', as one contemporary called him (Guilandino 1558a, f 34), could deal with critics by dropping them from mention in his book ('*la mia scomunica*', my excommunication, as he called it), or by attacking them in savage, mordant prose designed to deter further criticism. 'I will give him a reminder', he wrote of one critic, Luigi Anguillara, 'that will keep his ears down lower than those of an English bloodhound' (Raimondi 1906, pp 167, 174).

Only a few botanists dared to criticize Mattioli openly, but what they had to say is of particular interest. Pietro Antonio Michiel, for instance, speaking with the independence of a Venetian nobleman as well as a botanist, stated that many of the illustrations in the 1554 edition were not drawn from life but were purely fictitious, that Mattioli's work was full of such presumption that students and teachers alike at Padua filled his ears with accounts of its shortcomings. No good could come, he wrote, from imagining a whole plant on the basis of a twig or dried leaf. What was needed was a labour like his own in raising plants, watching their development from beginning to end, describing the whole in words and illustrations (Toni 1908, p 41). In Michiel's comments there is a scorn for Mattioli as someone who eschewed the labour of planting a botanical garden of his own, who never formed a natural history collection or even a herbal of dried plants – someone who therefore had a ready-made excuse when critics asked him to demonstrate dubious plants which he had portrayed in his commentaries.

In the first edition Mattioli proclaimed his concern for truth, and invited colleagues to be critical of his work. Woe betide any botanist who took this seriously: '*Sta sempre su la vendetta*', he is always out for revenge, wrote the Neapolitan doctor Bartolomeo Maranta (Toni 1911–12, p 1550). Take, for instance, Mattioli's treatment of one of his most persistent critics, Melchiorre Guilandino. Born in Prussia, Guilandino came to Italy as a young man and quickly developed an interest in botany. By 1554, when Mattioli's first illustrated Dioscorides

appeared, he had already carried out botanical research in Greece and on the coast of Africa. He had settled in Padua, where he shared the house of Gabriele Falloppia. His friendship with Falloppia, who held the chair of materia medica as well as that of anatomy, was to be the decisive influence in his career. It was Falloppia who helped to finance Guilandino's research in the Middle East from 1558 – 'God grant', he told his students, 'that the shrewd and subtle Guilandinus, who has now begun his journey to the East Indies, may come home to us safe' (Favaro 1928, p 132) – it was Falloppia who ransomed him when he fell into the hands of corsairs, and it was probably Falloppia who helped him get the post of custodian of the Paduan botanical garden on his return.

In a letter to Conrad Gesner of Zurich, unwisely published in 1557, Guilandino criticized several of Mattioli's plant identifications, accusing him of textual mistakes and of overlooking relevant clues tucked away in the works of Galen (Guilandino 1557). Mattioli replied forcefully in an open letter to Falloppia, stinging Guilandino to publish in return an Apology against Pietro Andrea Mattioli, subtitled 'Mattioli's calumnies refuted, and 100 more of his errors pointed out'. Here Guilandino wrote that Mattioli would have done better to correct errors in his own book: 'that dung-heap, the edition of 1554', 'that lurid rag-bag, constantly being retouched, but never complete, which he calls a commentary on Dioscorides'. And Guilandino went on to attack Mattioli as a plagiarist: 'who is more greedy', he asked, 'in copying the opinions of others?' (Guilandino 1558*b*). Not surprisingly, the Apology drove Mattioli to fury. Guilandino, he had discovered, was the ill-bred son of a priest, a man whose poverty when he first came to Italy had led him to look after donkeys in Sicily, where he picked up ass-like habits. And when Guilandino set off at this point for his field work in the Middle East, Mattioli's vengeance pursued him, with attempts to rob him of the patronage of the Venetian ambassador in Constantinople. More than this, Mattioli began to make insinuations about Falloppia's relationship with Guilandino: 'that sordid hermaphrodite' (Pietro 1970, pp 44–47). Falloppia – said to have been the son of one of Europe's earliest syphilitics, well-known as a misogynist, whose lectures were full of anti-feminist asides, who refused to advise women on how to avoid syphilis on the grounds that 'it is fitting that there should be . . . some way in which they pay the price of their crimes' (Favaro 1928, p 153) – Falloppia was an easy target for insinuation. And when he carefully kept out of the quarrel, Mattioli was not slow to draw the conclusion: 'he loves perhaps the vices of his Guilandino, and the gallantry of so sweet an hermaphrodite, more than truth and my reputation' (Raimondi 1906, p 159).

Tasteless as it is, sixteenth century invective and controversy of this kind has a lot to tell us about the academic community of the period, and about the work it was doing. What is most striking about the whole controversy is how bookish it was. It is hard to believe that this debate spanned the late 1550s and early 1560s, on the eve of publication of two reminders of a wider world – Garcia da Orta's book on the materia medica of the Indies, and Nicolas Monardes' book on that of the Americas. Guilandino's arguments were essentially that Mattioli was ignorant of classical texts – Theophrastus, Pliny, Paul of Aegina, Plato, Plotinus, Plutarch, Aristotle, Livy, Seneca, Pausanias, Polybius and so on – and that his knowledge of Latin and Greek was not adequate to the task of textual interpretation. It is a striking indication of the nature of sixteenth century Italian botany that Guilandino, the most travelled of his colleagues, so experienced in field work, was also arguably the most bookish. He was a man who came to Italy with nothing, but who bequeathed to Venice on his death a library of 2400 books, their margins crammed with his botanical notes, neglected today, and for the most part unread (Ferrari 1959, Rose 1976); a man whose prose was strewn, not to say littered, with references to classical texts – literary as well as botanical – and who could scarcely pen a Latin sentence without lapsing in mid-flow into Greek. This was the man who had charge of the botanical garden at Padua right up to 1589, and whose pupils, like Prospero Alpino, continued his work into the seventeenth century. So that although historians of botany continue to declare that the Renaissance 'turned men's eyes to living plants in the field and away from the pages of the classics' (Morton 1981, p 116), as far as Italy is concerned they are wide of the mark. Certainly there was exploration, field work and observation, but all of them were harnessed to the aim of understanding a classical text.

The aims of Italian botany become clearer if we look at a concrete example – for instance, *Aconitum pardalianches* or leopard's bane. Dioscorides' description was sketchy: it was a plant with a stem as tall as the palm of the hand, with 3 or 4 leaves, somewhat hairy, resembling those of the cyclamen, though smaller. Its root was like the tail of a scorpion, and glittered like alabaster. Of its powers, Dioscorides wrote that it stupified a scorpion that touched it, and it was poisonous to panthers, pigs, wolves and all wild beasts. Its medicinal value was as an analgesic in medicines for the eyes (Mattioli 1554, pp 479–480). The first Renaissance botanist who claimed to have identified *Aconitum* was probably Leonhart Fuchs. He identified it in 1542 with *Herb paris* (Fuchs 1542, p 86). Mattioli was scornful. *Herb paris*, he noted, was twice as tall as *Aconitum*, and its root was nothing like a scorpion (Mattioli 1548, pp 559–560). Moreover, Petrus Pena and Matthaeus Lobelius later fed *Herb paris* to dogs and lambs, without doing them any harm (Pena & Lobelius 1570, p 105). Mattioli himself identified *Aconitum* with another plant which he claimed to have found in the area of Trent (Mattioli 1554, p 480). Conrad Gesner did not believe him. The root, in particular, made him suspect that Mattioli's over-neat illustration of this plant had been made up purely on the basis of Dioscorides' description. Instead, Gesner thought *Aconitum* could be identified as yet another plant, *Tora venenata*, and he claimed in 1555 to be the first to publish a picture of this true leopard's bane (Gesner 1555, pp 39–40). Mattioli replied that Gesner's plant was no more like Dioscorides' description than crows were to swans (Mattioli 1559, p 555). It was at this point that a very striking suggestion was made. Rembertus Dodonaeus in the Low Countries, and the Paduan botanist Giacomo Antonio Cortusio, both put forward the view that Dioscorides' *Aconitum* could be identified as the plant *Doronicum* (Dodonaeus 1557, Borgarucci 1567). The roots of *Doronicum* had been introduced into therapeutics by the Arabs as a drug beneficial to the heart, and it was in current use in internal medicine. To associate *Aconitum* and *Doronicum* was therefore to say that a dangerous poison, leopard's bane, was being regularly administered to unsuspecting patients. Cortusio decided to test his idea. He began to administer controlled doses of *Doronicum* to wolves, dogs and pigs. Each of them died in a short time (Borgarucci 1567). He reported his findings to Mattioli, Calzolari, Borgarucci and others, all of whom repeated the experiments with the same result. There began an international slaughter of chickens, pigs, wolves and dogs as the news spread. Sceptical at first, Mattioli gave one of his pet dogs four drachms of *Doronicum* root in raw meat. At first nothing happened. At supper the dog gobbled up scraps which Mattioli threw from his table, and even mounted several times a bitch which was in the house. But after seven hours it suddenly fell into a fit, and died foaming at the mouth. For Mattioli the moral was clear. '*Doronicum*' might rather be called '*Daemonicum*' – the devil had placed it in the pharmacies in the stead of the true Arabic original. This discovery would bring its banishment from pharmacy and save countless lives. How pitiable, wrote Mattioli, were the Middle Ages which had perpetuated such errors, and how glorious the advances of his own day (Mattioli 1565, p 1087).

But granted that *Doronicum* was poisonous to animals, was its effect on humans necessarily the same? In writing up his experiments on hens, Prospero Borgarucci wrote that he hoped the work would come to the attention of some prince, with the power to experiment on human subjects (Borgarucci 1567). This appeal was more than fanciful. Mattioli had included in his commentaries Dioscorides' 6th book, on poisons and antidotes, and it was a subject which aroused the greatest interest. It even had practical application, for on at least one occasion it fell to Guilandino as director of the Paduan garden to supply a poison to the Venetian Council of Ten for secret use against an enemy of the Republic (Rizzi 1951). Mattioli witnessed experiments on prisoners condemned to death as a young man in Rome in 1524 and later in Prague in 1561. In the 1524 experiment two prisoners were poisoned with *Napellus*, wolf's bane. One was given a supposed antidote, the other acted as a control. In the 1561 experiment several different antidotes were tested for their effects on different poisons. Falloppia had similar opportunities at Pisa. There the Medici allowed him to combine nicely his interests in *materia medica* and anatomy, for living prisoners were supplied to him, first for experiments with poisons and antidotes, and subsequently for anatomy (Corradi 1886).

No record has come to light suggesting that *Doronicum* was tested on prisoners, but botanists were sometimes brave or foolhardy enough to test drugs on themselves. Conrad Gesner, who found that one drachm of *Doronicum* killed dogs, nevertheless tried two drachms on himself in 1565. He survived, though he was ill with stomach pains for some days. His conclusion was that if *Doronicum* was not fatal, it was at least dangerous, and ought to be banned from pharmaceutical use (Gesner 1577, ff 74r–78r).

Here, then, we have a good example of what Italian botanists were trying to achieve, and of the difficulties which they met. In this instance they could claim the two successes they looked for. On the one hand a classical plant was rediscovered. On the other, a poisonous plant which had crept into the pharmacopoeia was removed. We know that this practical effect was achieved, for Castore Durante wrote in his 'Herbario Nuovo' that he personally banned *Doronicum* from pharmacies in the Papal states while serving as *Protomedico* (Durante 1585, p 6). In this case botanists even had recourse to drug-testing, though in a very limited form, an odd experiment designed to show a relation between a living plant and a description in an ancient text. Bookish and backward-looking as it was, and increasingly parochial in the late 16th century as Spanish and Portuguese botanists began to explore a wider world, Italian botany did make a practical impact on therapeutics. In his 'Herbario Nuovo' Castore Durante gave lavish praise to Cortusio for his work on *Doronicum*: 'May the nymphs give you violets and lilies, and crown your brow with garlands, and may your name live on for ever' (Durante 1585, p 160). He would have been pleased to know that modern botanical nomenclature contains a minor monument to Cortusio and Renaissance botany: no longer *Doronicum* or *Aconitum pardalianches*, but a Renaissance hybrid – *Doronicum pardalianches*.

## References

- Battiato C (1972) *Rivista di Storia della Medicina* 16, 155–163
- Blunt W (1950) *The Art of Botanical Illustration*. Collins, London
- Blunt W & Raphael S (1980) *The Illustrated Herbal*. Frances Lincoln, London
- Borgarucci P (1567) *La fabrica de gli spetiali*. Venice
- Branca V (1973) In: *Renaissance Venice*. Ed. J R Hale. Faber and Faber, London; pp 218–243
- Calzolari F (1566) Lettera . . . intorno ad alcune menzogne . . . date alla sua theriaca. Cremona
- Chiovenda E (1930) *Atti dell' Ottavo Congresso Internazionale di Storia della Medicina*, Roma. V Lischì & Figli, Pisa; pp 488–509
- Corradi A (1886) *Annali Universali di Medicina e Chirurgia* 277, part 2, 73–100
- Dioscorides (1965–70) *De materia medica* (codex medicus graecus 1 of the Austrian National Library). 2 vols. Akademische Druck, Graz
- Dodonaeus R (1557) *Histoire des plantes*. Antwerp
- Durante C (1585) *Herbario nuovo*. Rome
- Favaro G (1928) *Gabrielle Falloppia modenese. Immacolata Concezione*, Modena
- Ferrari G E (1959) In: *Libri e stampatori a Padova*. Ed. A Barzon. Tip Antoniana, Padua; pp 377–463
- Fрати L (1907) *Catalogo dei manoscritti di Ulisse Aldrovandi*. Nicola Zanichelli, Bologna
- Fuchs L (1542) *De historia stirpium*. Basel
- Gesner C (1555) *De raris et admirandis herbis*. Zurich
- Gesner C (1577) *Epistolae medicinales*. Zurich
- Guilandino M (1557) *De stirpibus aliquot*. Basel
- Guilandino M (1558a) *De stirpibus aliquot*. Padua
- Guilandino M (1558b) *Apologiae adversus P. A. Matthaeolum*. Padua
- Hessus P (1562) *Defensio XX problematum adversus M. Guilandino*. Padua
- Maranta B (1572) *Della theriaca et del mithridato*. Venice
- Mattioli P A (1548 and 1550) *Il Dioscoride*. Venice
- Mattioli P A (1554) *Commentarii*. Venice
- Mattioli P A (1559) *I discorsi*. Venice
- Mattioli P A (1561) *Epistolarum medicinalium libri quinque*. Prague
- Mattioli P A (1565) *Commentarii*. Venice
- Mattioli P A (1568) *I discorsi*. Venice
- Mieli A (1921) *Gli scienziati italiani*. Nardecchia, Rome; vol 1, part 1
- Morton A G (1981) *A History of Botanical Science*. Academic Press, London
- Pena P & Lobelius M (1570) *Stirpium adversaria nova*. London
- Pietro P di (1970) *Epistolario di Gabriele Falloppia*. Università di Ferrara
- Raimondi C (1906) *Bullettino Senese di Storia Patria* 13, 121–185
- Reeds K M (1976) *Annals of Science* 33, 519–542



- Riddle J M** (1980) In: *Catalogus translationum et commentariorum*, vol 4. Ed. F E Cranz and P O Kristeller. Catholic University of America Press, Washington; pp 1–143
- Rizzi G** (1951) *Il Friuli Medico* **6**, 7–31
- Rose P L** (1976) *Physis* **18**, 117–130
- Schmitt C B** (1971) In: *Catalogus translationum et commentariorum*, vol 2. Ed. P O Kristeller and F E Cranz. Catholic University of America Press, Washington; pp 239–322
- Singer C** (1927) *Journal of Hellenic Studies* **47**, 1–52
- Tergolina-Gislanzoni-Brasco U** (1934) *Bollettino dell' Istituto Storico Italiano dell'Arte Sanitaria* **14**, 293–310
- Toni G B de** (1907) *Memorie del R. Istituto Veneto di Scienze, Lettere ed Arti* **27**, 1–42
- Toni G B de** (1908) *Memorie dell'Accademia di Scienze, Lettere ed Arti in Modena* series 3, **9**, 21–70
- Toni G B de** (1911) *Atti della I. R. Accademia di Scienze, Lettere ed Arti degli Agiati in Rovereto* series 3, **17**, 149–171
- Toni G B de** (1911–12) *Atti del R. Istituto Veneto di Scienze, Lettere ed Arti* **71**, 1505–1564
- Venice, Archivio di Stata** (1545) Senato, Terra, Reg. 34, ff 57v–58r, 31 July
- Venice, Istituzioni di Ricovero e di Educazione.** Zitelle, Commissaria di Maria Massa